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(19) (CA) **APPLICATION FOR CANADIAN PATENT** (12)

(54) Early Warning System

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ABSTRACT

This invention enables the notification of large numbers of people in a geographic region in the case of emergency using the public switched telephone network. The system allows determination of the region to be notified and the language of notification, and delivers an audible voice message with instructions, to the telephones in the affected area. The message may be delivered by a variety of means corresponding to the severity of the emergency and the urgency of the instructions. Notification is returned to the agency issuing the notification of all telephones in the affected area which did not receive the voice message so that additional actions may be taken, if necessary.

This invention relates to the notification of large
segments of the population in the event of an emergency,
natural disaster, act of war, or other significant occurrence.

Part of everyday life is the possibility of
emergency or natural disaster. Recognizing this, governments
and communities have long organized emergency measures
offices, among whose responsibilities is the notification of
populations who may be affected by the emergency. To date, no
effective pro-active means has existed for carrying out this
10   notification.

Radio and television broadcasts have been used in
the past to notify populations, but these means required that
the affected persons have appropriate terminal devices tuned
to the television or radio network being used. Paging systems
have been used to notify limited groups of persons, but
ultimately, either these persons or the emergency measures
groups must go door to door to ensure that all affected
persons receive the emergency notification. In addition, use
of broadcast means or paging networks contacting a
20   pre-determined list of people carries the possibility of the
alert notification being carried far beyond the region
affected. This can have several undesirable consequences,
including panic in unaffected areas or crowds of the curious
entering affected areas, making a bad situation worse.

U.S. Patent 5,278,539 (Lauterbach & Wise) describes
a system for notifying large numbers of people in the event of
an emergency. Lauterbach & Wise is intended to notify a
large, but finite, segment of the population primarily

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consisting of emergency workers, for example, a volunteer fire
department. The individuals to be notified are pre-selected
in the system and notification takes place via a radio paging
technology. The Lauterbach & Wise system provides audible
tone notification only, requiring the recipient to tune in to
the U.S. Emergency Broadcast Network on receipt of a tone.
Lauterbach & Wise do mention the possibility of using the
public telephone network but only for an initial alarm
portion.

10   What is required is a system which allows emergency
workers to notify only those people in an affected area, in a
positive manner, and return an indication of who has not been
notified to the Emergency measures office and it is an object
of this invention to meet this goal.

      This invention aims to use the qualities and
strengths of the public telephone network, combined with
other, more recently developed systems, to solve the problems
related to emergency notification of large groups of people.

      The invention is a system for notifying residents of
20   a geographical area of an event. The invention was initially
developed relative to delivering emergency evacuation
warnings, but the delivery of notices for a variety of
reasons, emergency or not, is feasible with the same process.
The main features of this invention are the ability to, from a
single control point, dynamically select the geographic area
to be notified, choose the language of notification, the
severity of the notification, and the type of notification to
be delivered. Examples of types of notifications would

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include a warning for a flood as distinct from a warning for a forest fire, an act of war, a nuclear disaster, or any other type of emergency or non-emergency notification.

The process notifies homes and businesses in the selected region by either delivering a voice message to the voice mailbox corresponding to each telephone in the region, or by ringing all of the telephones in the region and delivering an audible message to each from an Interactive Voice Response (IVR) system. If the telephones are rung by the IVR system, a distinctive ring alerts residents that the arriving message is coming from the event notification system. The choice of notification method depends on the urgency of the message being delivered. The process returns a log to the user listing all telephones in the region where the message was not received, so any additional appropriate action may be taken.

Telephones have become almost ubiquitous in all homes. These telephones are all connected to public telephone networks and are all contactable via telephone switching systems and the telephone numbering plan. The telephone, therefore represents an instrument which can be used to carry out the notification of large numbers of people. In addition, the telephone numbering and switching system in place today in the public telephone network allows only selected telephones to be contacted (or only one telephone, in the case of a common telephone call) and provides a speaker for the delivery of messages and instructions.

The development of Automatic voice messaging and

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Interactive Voice Response have provided the means for a
pre-recorded message to be selected and delivered to large
groups of telephones simultaneously. The development of
Geographical databases, used for land title, tax, or telephone
plant inventory tracking, provide a means of selecting a
geographical region and identifying, in some manner and
possibly by telephone number, every telephone in that region.

In contrast to Lauterbach & Wise the present
invention allows the notification of the entire population of
10 a region, as opposed to emergency workers only. This
notification takes place using the public telephone network,
eliminating the need for a private paging network. The
selection of persons to be notified is dynamically selectable,
whereas the Lauterbach & Wise invention requires pre-
determination. This invention also notifies recipients with
an audible voice message, which may include instructions for
additional actions to be taken. This eliminates the need for
the persons notified to tune in to Emergency Broadcasts
following initial notification.

20 The invention will be described in greater detail
with reference to the accompanying drawing in which:

Figure 1 is a schematic drawing showing the system
technical architecture;

Figure 2 is a schematic drawing representing an
interactive voice response method forming part of the
invention; and

Figure 3 is a schematic drawing representing a voice
messaging method forming part of the invention.

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As pictured in Figure 1, the preferred embodiment of the invention consists of the following elements:

1.   An operator console, from which commands can be input to any of the system components and where information is received by a system operator.

2.   A geographic information database, which contains information about a given region, divided geographically into sub-regions, and which presents information to the system operator via a computerized graphical user interface (GUI).

3.   An automated voice messaging system, which is connected to the public switched telephone network and which contains a digital message storage location (mailbox) corresponding to each residence in the region contained in the graphical information database.

4.   The public switched telephone network, which in this case serves the telephones in the region in question via digital telephones switches capable of delivering a variety of ringing signals to the residence telephones.

5.   A central control computer system which coordinates the operation of the system and returns information to the computer operator.

6.   A computerized database relating residential telephone numbers to exact geographic location for the region.

7.   An Interactive Voice Response computer system capable of initiating telephone calls and containing a variety of pre-recorded messages relating to different

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types of emergency situations.

In one embodiment of the invention, the operator location for the system is located in a regional emergency measures organization location. When this location receives notification of a pending emergency, the system operator selects the affected sub-region using the GUI on the geographical information system. The operator then selects the language of choice for the affected region and the level of the emergency warning required. The operator then uses the emergency warning system control station to command the control system to initiate the appropriate warning.

In the case of a low-level warning, the control system retrieves the previously selected geographical information from the geographical information database and uses this information to access the telephone number database and acquire the telephone numbers for all telephones in the selected geographical sub-region. These telephone numbers are sent to the automatic voice messaging system, illustrated in detail in Figure 3, which sends a pre-recorded urgent audible message to the mailbox corresponding to each of the telephones in the affected sub-region. If any mailbox has been de-activated, or is inaccessible for any reason, the voice messaging system sends a notification of this condition to the control system. The control system then produces a listing of all inaccessible mailbox locations for the operator so appropriate action may be taken.

In the case of a high-level warning or pending evacuation of homes, the operator initiates notification as in

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the case above. After the control system has acquired the
affected telephone numbers from the telephone number database,
the control system sends these numbers to the Interactive
Voice Response system, illustrated in detail in Figure 2,
which then calls each of the telephone numbers affected. When
the telephone is answered, an audible message is delivered
describing the type and urgency of the emergency and
recommended immediate action to be taken.

10   The system is set up to work with the public
telephone network such that any call initiated from the
emergency IVR system will result in a distinctive ringing
signal being received at the affected residence. The ringing
signal commonly chosen is a combination of three short rings,
three long rings, and three short rings, corresponding to the
Morse code representation for S-O-S.

        After a predetermined time period, the IVR system
records the telephone numbers for which the notification call
has not been answered. These numbers are sent back to the
control system, which then produces a log of all non-
20 responding residences for the system operator so appropriate
additional action may be taken.

THE EMBODIMENTS OF THE INVENTION IN WHICH AN EXCLUSIVE
PROPERTY OR PRIVILEGE IS CLAIMED ARE DEFINED AS FOLLOWS:

1.   A method of notifying or warning residences of an
emergency or other event by means of an audible message
broadcast to residential telephones over the public switched
telephone network.

2.   A method as in claim 1, where the selection of
residences which require notification is made using a
geographical information database.

3.   A method as in claim 2, where the telephone numbers
associated with the affected residences are selected from a
database of telephone numbers automatically following
selection of the affected geographic area using the geographic
information database.

4.   A method as in claim 1 or 2, where the broadcast
message to the residence telephones is provided by an
Interactive Voice Response (IVR) computer system with the
capability of initiating outbound calls.

5.   A method as in claim 1 or 2, where the audible
broadcast message is delivered by an automatic voice messaging
system to a storage areas in the messaging system (mailboxes)
associated with each of the affected residential telephone
numbers and where the residents are notified of the presence

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of the message in the mailboxes by visible or audible signal on the telephone or by receiving a distinctive dial tone (stutter dial tone) on lifting the telephone handset.

6.   A method as in claim 4 or 5, where the audible message is selectable from a set of pre-recorded options by the system operator depending on the type and/or severity of the emergency or other event.

7.   A method as in claim 2,4, or 5 where the language of message delivery is selectable by the system operator manually, or where the language of message delivery is selected by the system based on the input from the geographical information database.

8.   A method as in claim 4 where the residents are notified by the application of a distinctive ringing signal on the telephone by the public telephone network in response to input from the notification system.

9.   A method which combines claims 4 and 5 and in which the choice of the form of message delivery is made by the system operator or the notification system depending on notification type and/or urgency.

10.   A method as in any of the previous methods, in which a log or notification is returned to the system operator listing the location of residences where the message or

warning was not received, either due to the telephone not
being answered, the voice mailbox not being accessed within a
pre-determined length of time, or because the telephone or
voice mailbox was inaccessible by the system for any reason.

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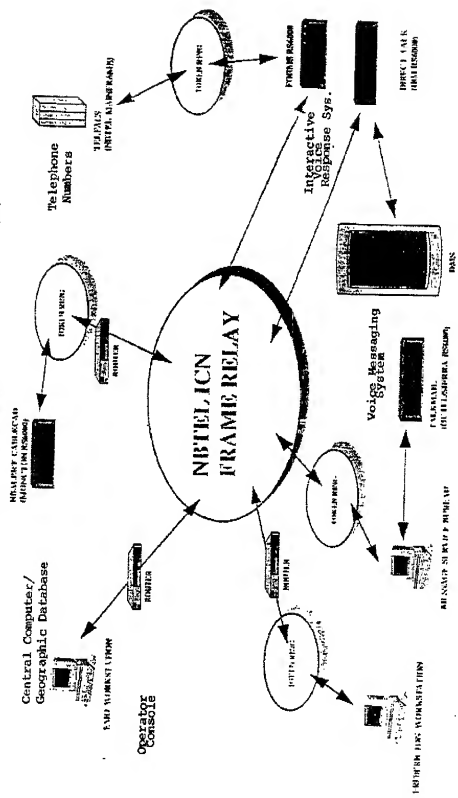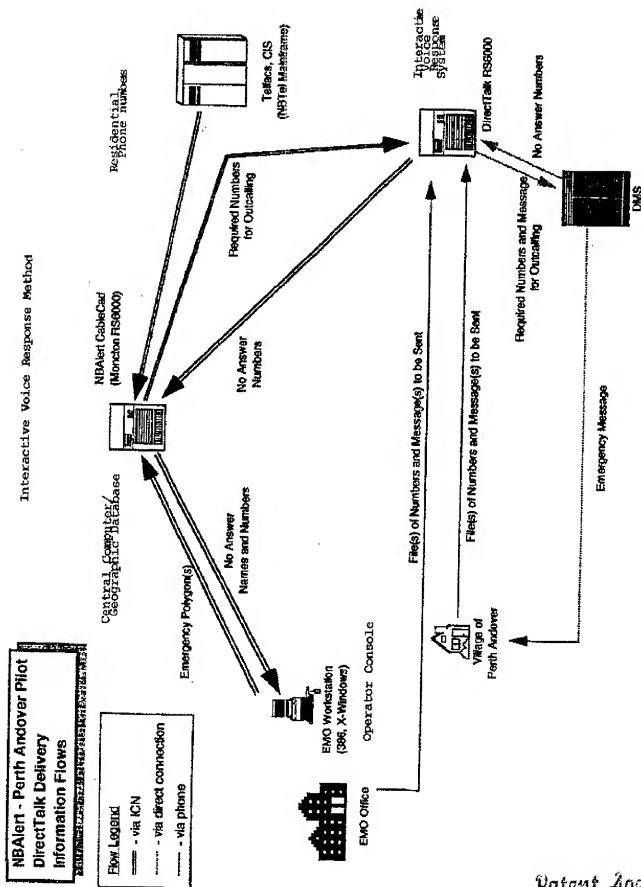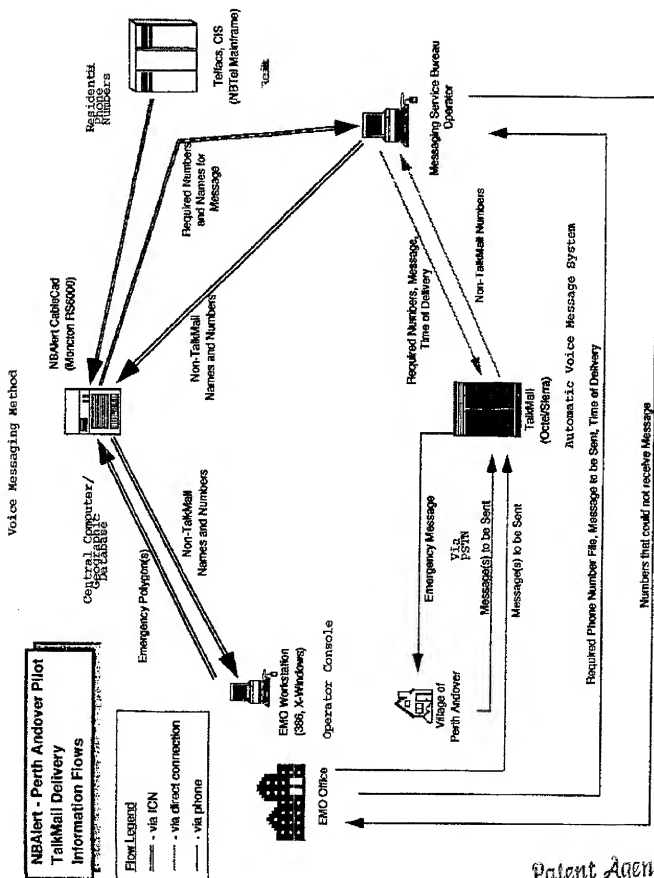OTTAWA, CANADA

PATENT AGENTS

TECHNICAL ARCHITECTURE

Central Computer/
Geographic Database

Operator
Console

Telephone
Numbers

Interactive Voice
Response Sys.

Voice Messaging
System

**NBTEL ICN
FRAME RELAY**

FIGURE 1

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F I G U R E 2

Voice Messaging Method

NBAlert - Perth Andover Pilot TalkMail Delivery Information Flows

Flow Legend
===== - via ICN
------- - via direct connection
——— - via phone

FIGURE 3